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EPA's Clean Power Plan
With a Focus on Demand-Side Energy Efficiency

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Internal Presentation for
Energy Technologies Area (ETA) Seminar
November 19, 2015

CPP Introduced by President Obama on August 3, 2015

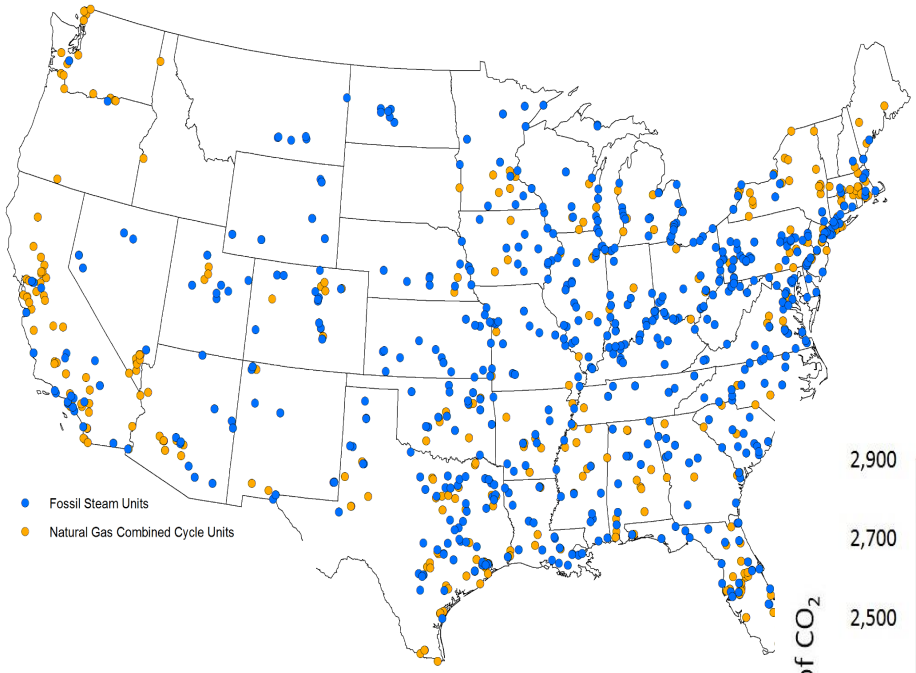
EPA took three actions intended to significantly reduce carbon pollution from power sector:

- Clean Power Plan (CPP) – existing sources
- Carbon Pollution Standards – new, modified and reconstructed sources
- Proposed Federal Plan and Model Trading Rules

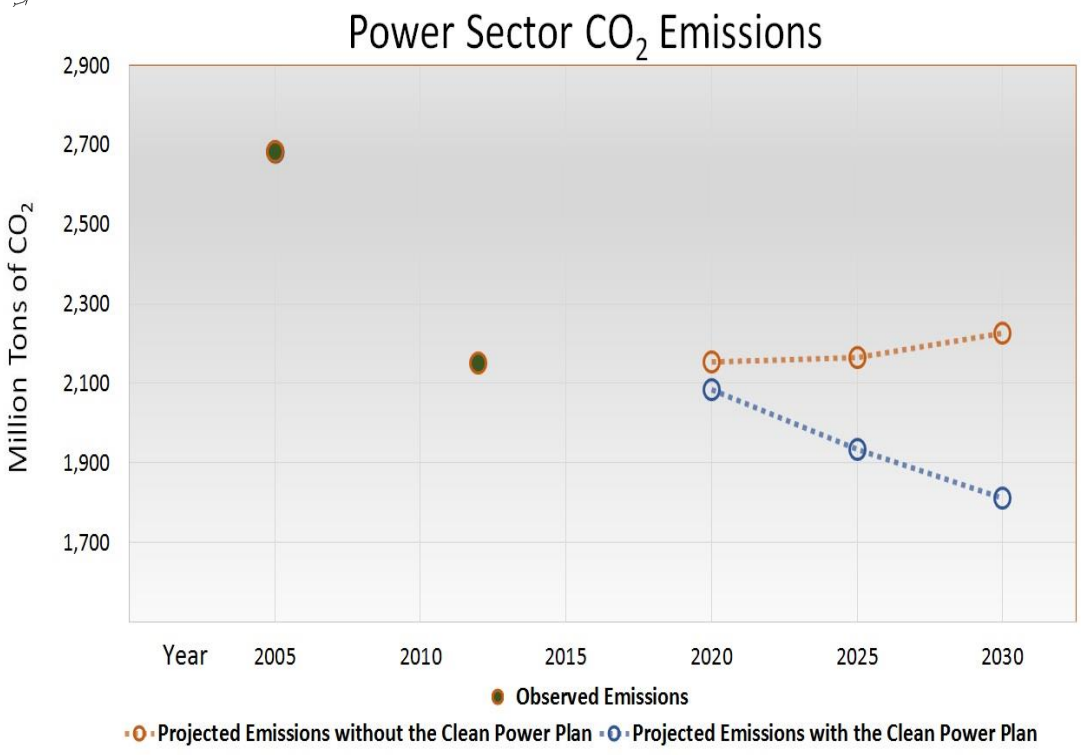
Federal Register - October 23, 2015

26 states suing EPA over CPP

Projected 32% reduction in carbon pollution (from 2005 levels) by 2030



Slide from U.S. EPA



Clean Air Act Regulation of Greenhouse Gases – slide from Bi-Partisan Climate Center

2007: Supreme Court decision *Mass v. EPA:* EPA authority to regulate GHGs

2009: EPA Endangerment Finding: GHGs endanger human health and welfare

2010: EPA motor vehicle tailpipe standards for GHGs
-- first CAA regulation of GHGs also triggered pre-construction permitting for many stationary sources

2011: Supreme Court: can't sue emitters under common law b/c EPA authority to regulate GHGs under CAA

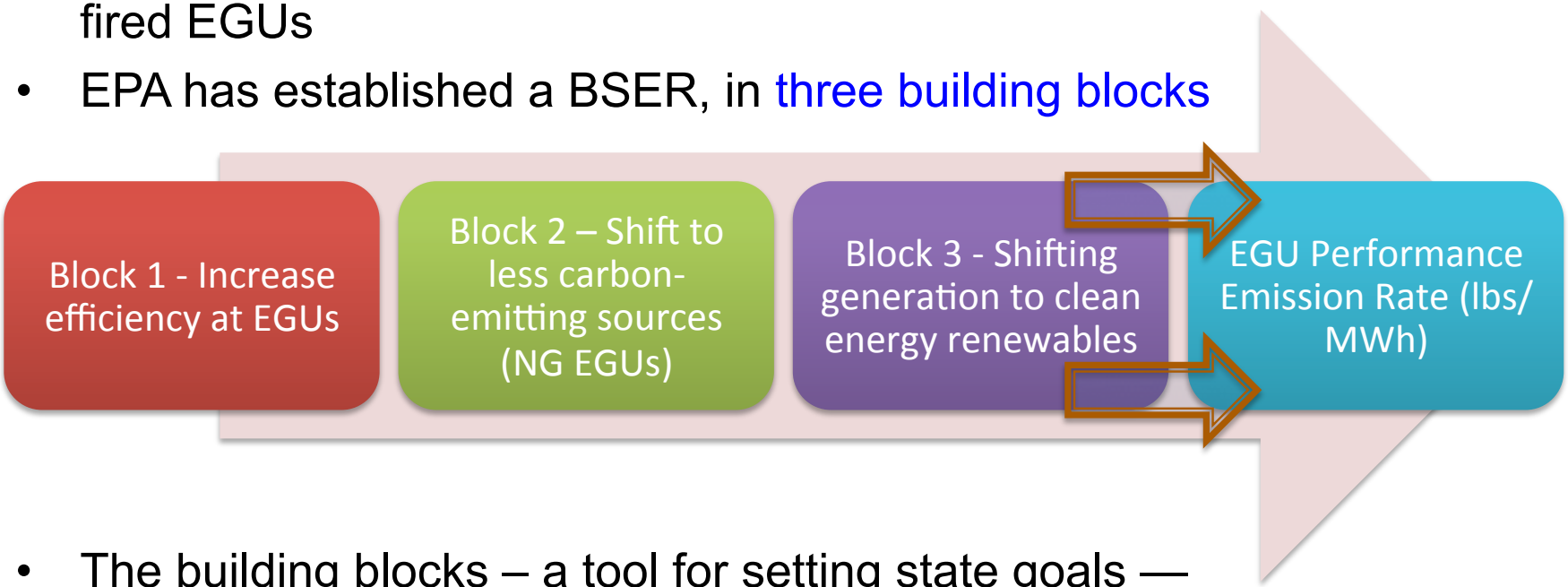
2014: Supreme Court: EPA has authority to regulate GHG from new power plants, provided the source is regulated for other pollutants

2014: EPA proposes power plant CO_2 regulations
-- standards for new builds
-- Clean Power Plan for existing plants

2015:
-- Final rule for *new* power plants
-- Final rule for *existing* power plants (Clean Power Plan)
-- Proposed rule: Federal Plan and Model Rules

CPP Goal Setting: BSER and Building Blocks

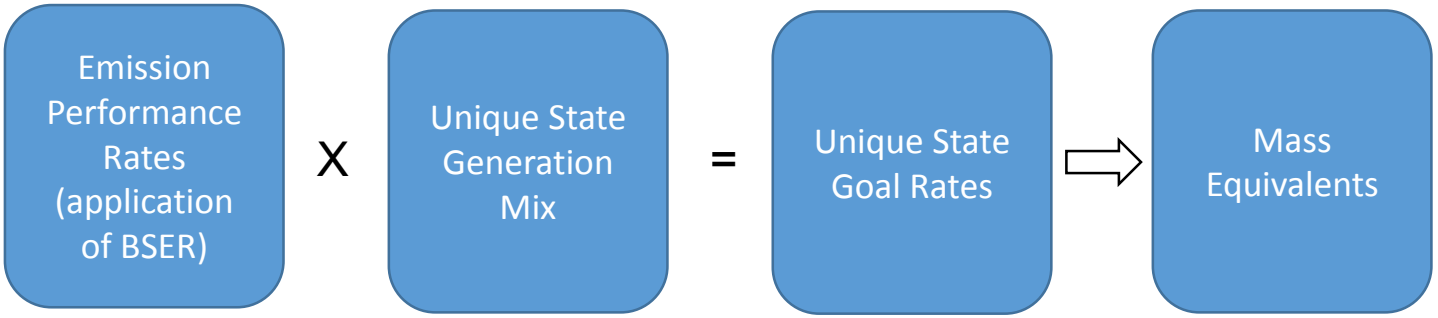
- EPA established CO_2 emission performance rates representing the Best System of Emission Reduction (BSER) for existing fossil fuel-fired EGUs
- EPA has established a BSER, in three building blocks



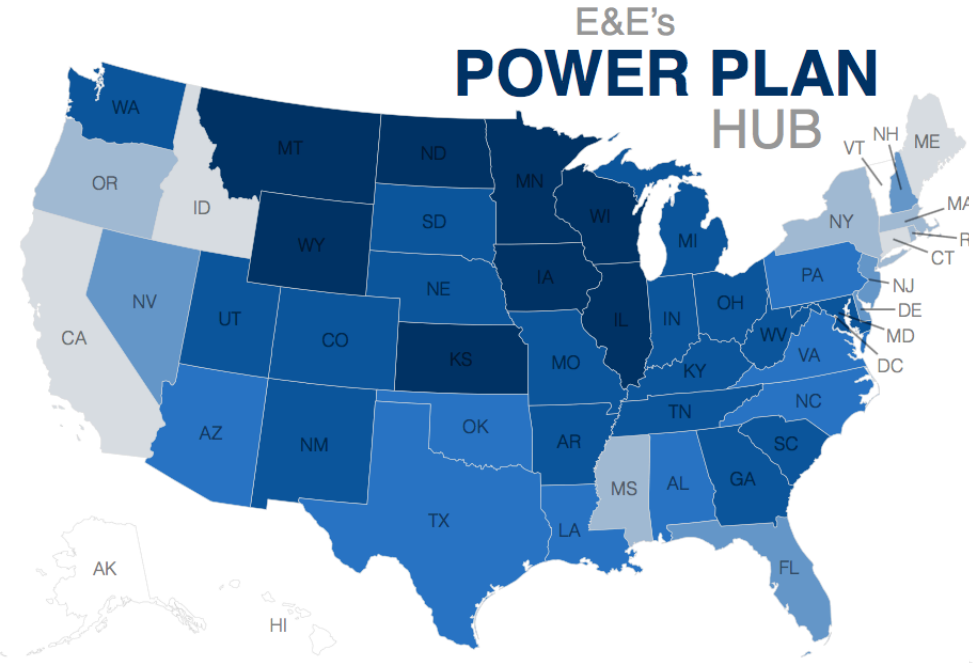
- The building blocks – a tool for setting state goals —
  - Yes, demand side EE was not used to set goals in final CPP
  - However, states are free to meet goal in the way that works best for them
  - States can rely more or less heavily on specific measures such as demand side efficiency or renewable energy

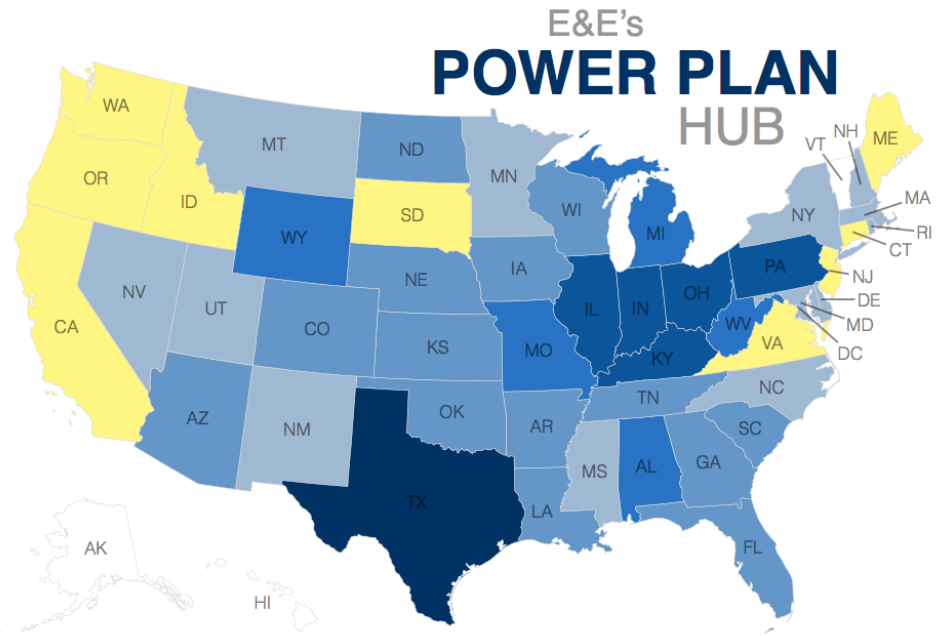
CO_2 Emission Goals

- Power plants are subject to the same standards no matter where they are located – one for steam generating unit EGUs, one for combustion turbines
- EGU emission performance rates have been translated into equivalent state goals
- EPA provided state goals in three forms:
  - Rate-based goal measured in pounds per megawatt hour (lb CO_2/ MWh)
  - Mass-based goal measured in short tons of CO_2
  - Mass-based goal with a new source complement (for states that



State by State CO_2 Goals – graphics from E&E Publishing





Final Rule Emissions Rate Reduction %

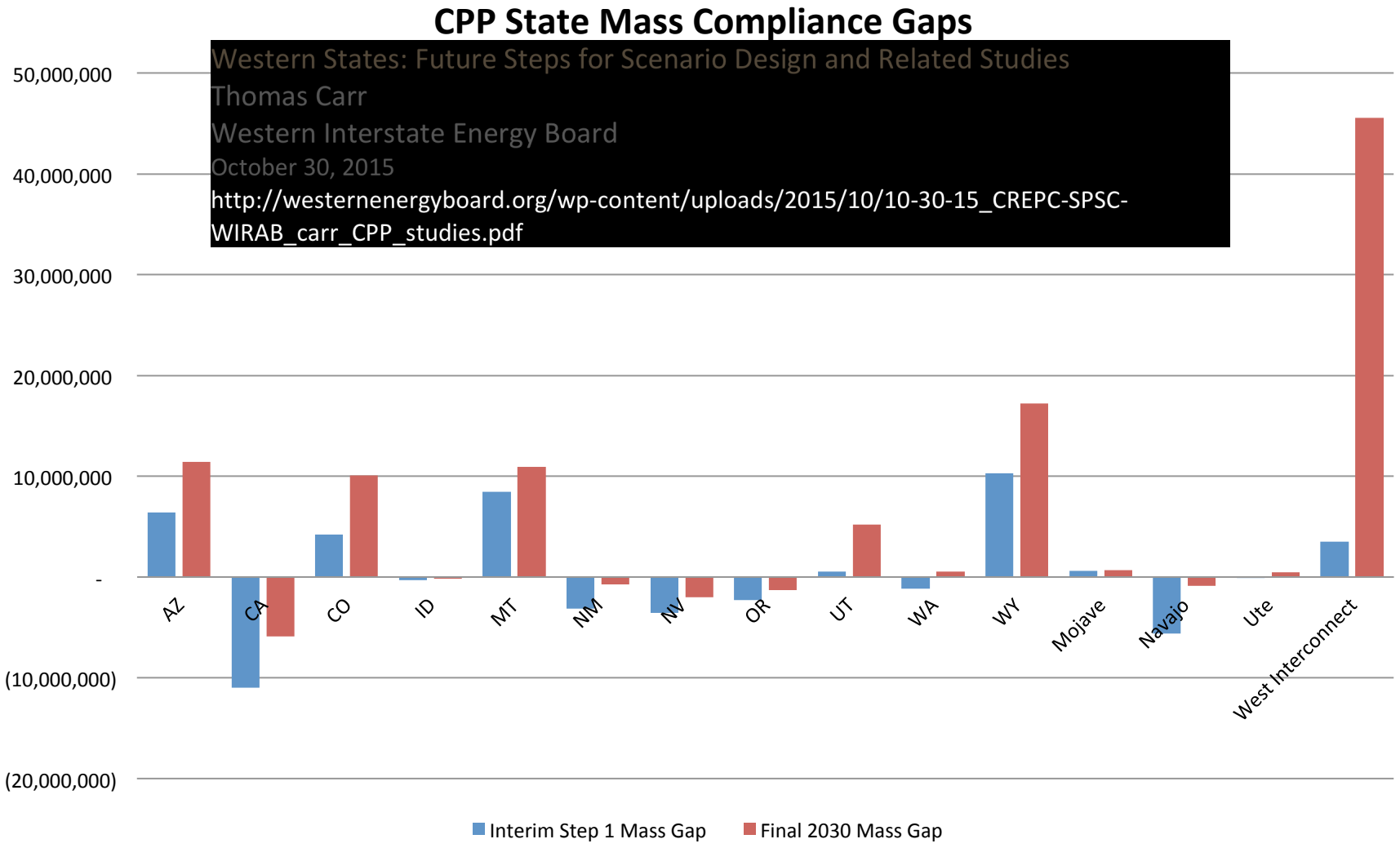
7 - 14%	14 - 21%	21 - 27%	27 - 34%	34 - 41%	41 - 47%
4 states	5 states	5 states	8 states	17 states	8 states

Final Rule Mass Reduction (short tons CO2)

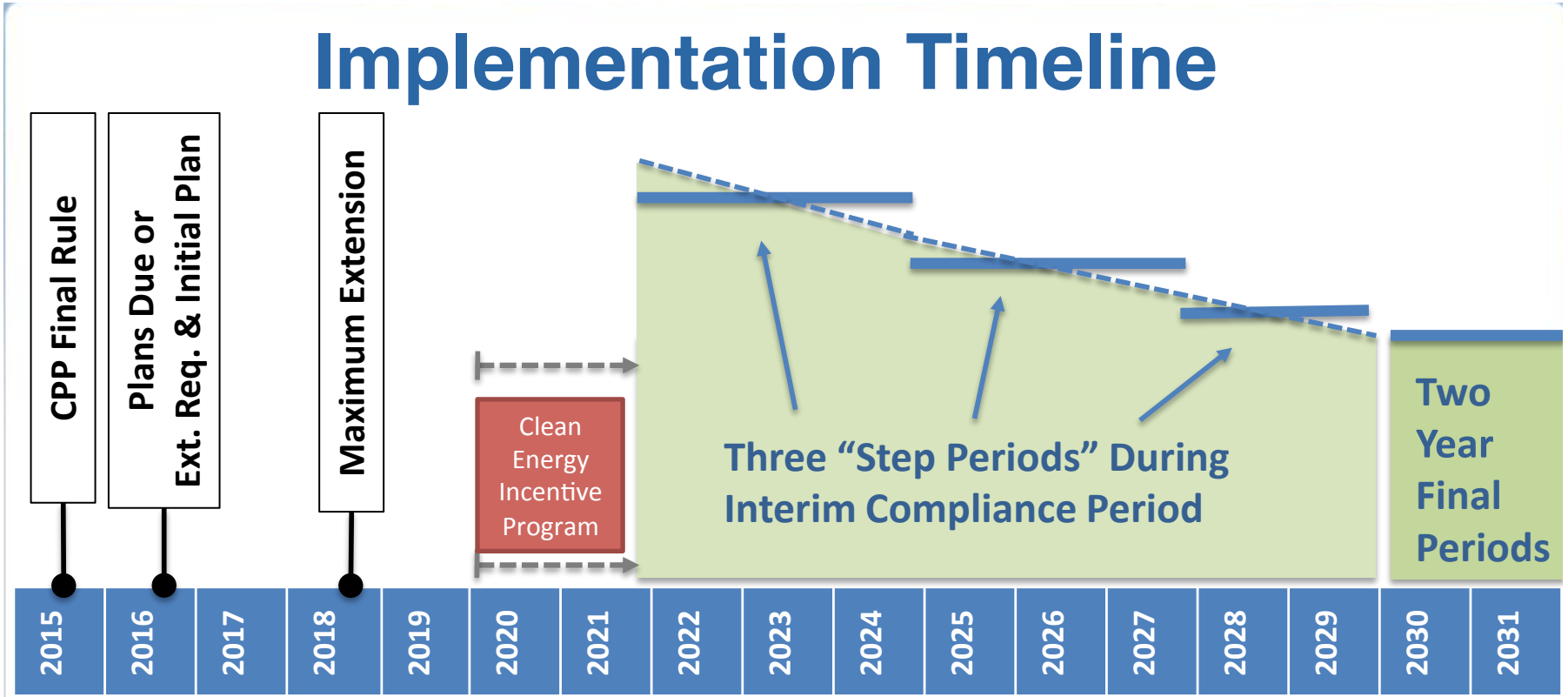
0 - 3.4M increase	0 - 8.5M	8.5M - 17M	17M - 26M	26M - 34M	34M - 51M
9 states	13 states	14 states	5 states	5 states	1 state

Graphics accessed on 8/11/15 from
http://www.eenews.net/interactive/clean_power_plan#updated_mass_reduction

Announced Retirements Take the West a Good Distance Toward Compliance



CPP Timeline – *slide modified from Georgetown Climate Center*



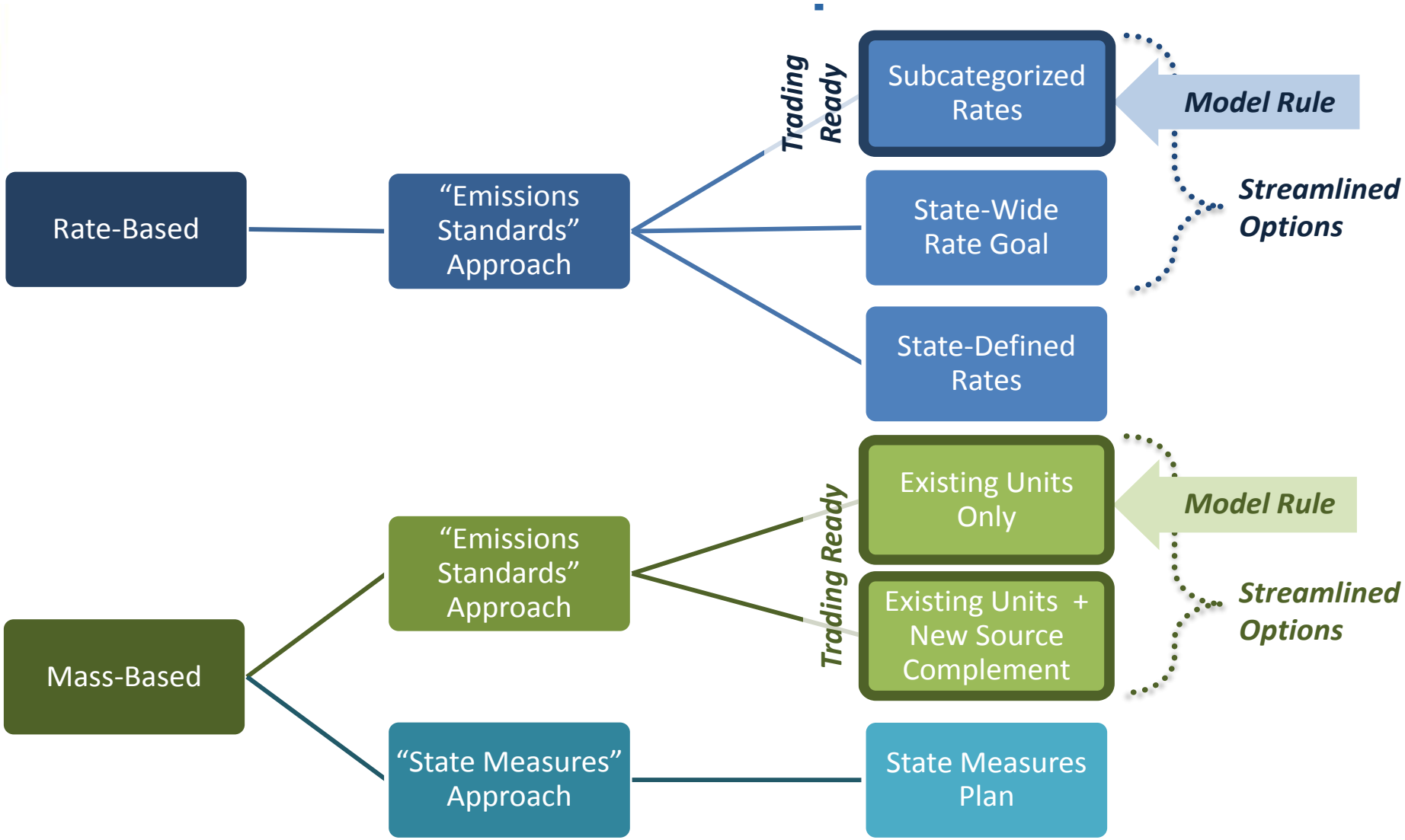
- **Plans due Sep. 6, 2016**
- **All states may request two year extension**
- **Compliance period start date delayed until 2022**
- **Step periods of 3, 3, and 2 years in interim period, function as milestones**
- **Two year compliance periods for final goal starting in 2030**

State Plan Types and Overall Approaches

- States pick a **mass-** or **rate-based goal approach**
- States submit a "State Plan" for affected EGUs to implement interim and final goals (or the federal plan is implemented)
- Federal enforcement is on the EGUs
- Two State Plan types:
  - **Emission standards plan** – includes EGU source-specific requirements ensuring all affected EGUs meet their goals
  - **State measures plan**– includes a mixture of measures implemented by the state, such as renewable energy standards and efficiency programs

Plan Type	Rate-Based	Mass-Based
Emissions Standard Plan	Obligation on Affected EGUs	Obligation on Affected EGUs (no need to describe complimentary measures)
State Measures Plan	N/A	State-enforceable measures with federally enforceable emissions standards backstop (e.g., RPS, EERS)

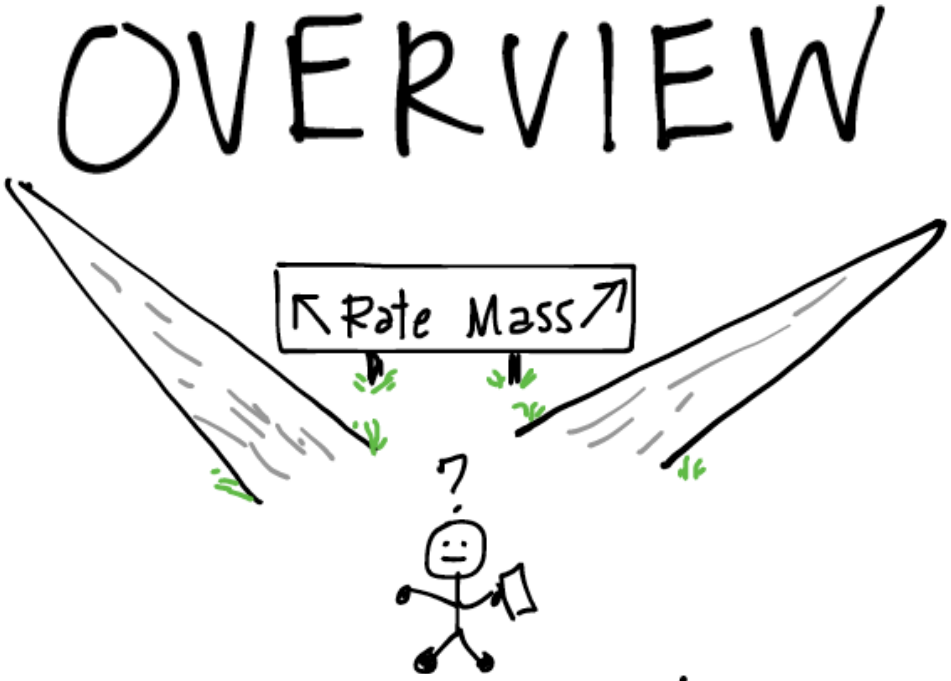
State Plan Options - *slide from Georgetown Climate Center*



A brief aside on "Mass" versus "Rate"

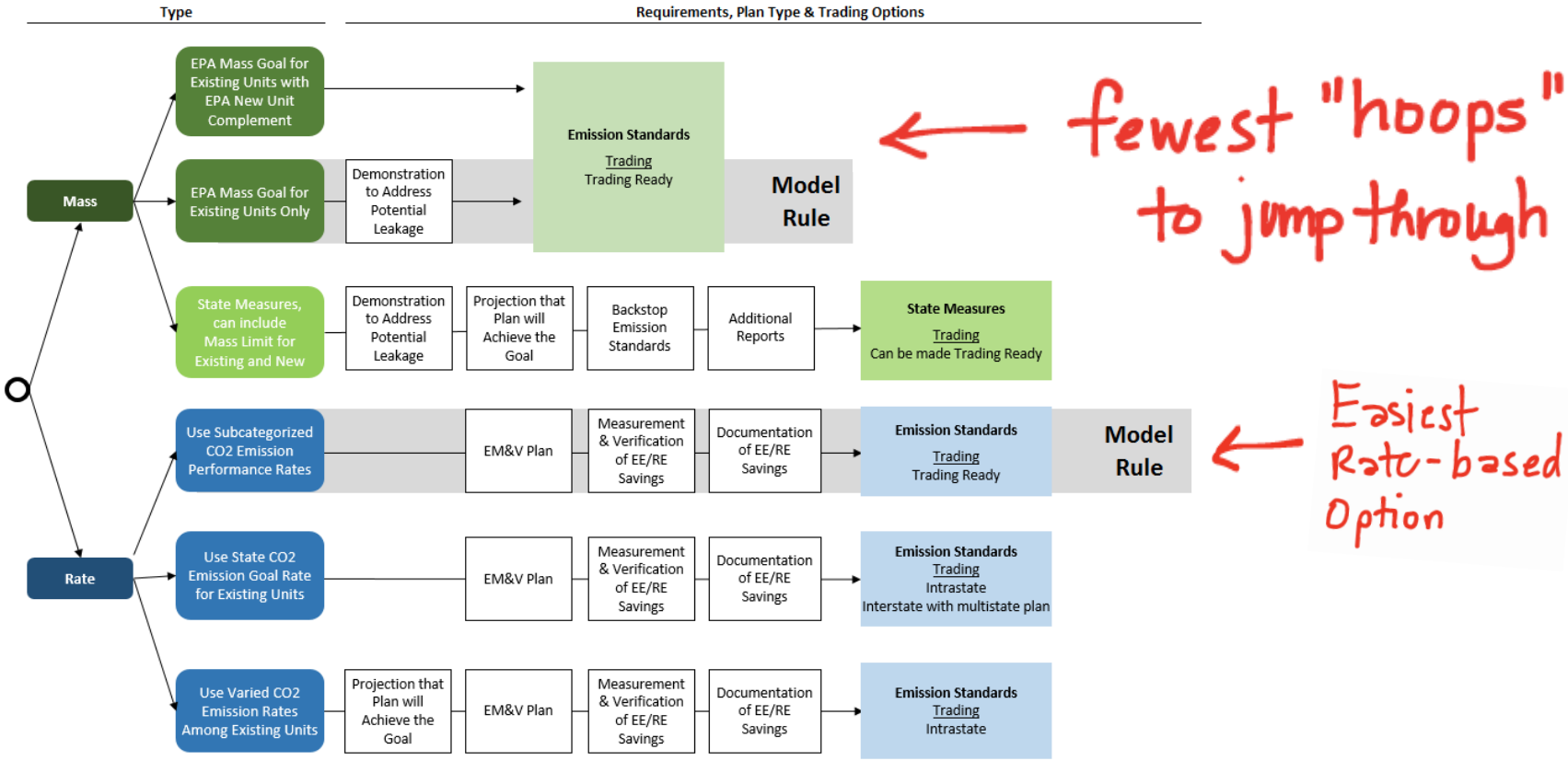
The following slides are form Franz Litz of the Great Plains Institute

OVERVIEW



- Two trading ready models < Rate / Mass
- EPA will use one for a federal plan, if called for
- EPA's cost analysis found mass 39% less costly + mass is easier + more predictable

EPA's MAPPING OF THE STATE PLAN APPROACH OPTIONS



← fewest "hoops" to jump through

← Easiest Rate-based Option

Message: Mass is easiest, with less EPA involvement/fewer approvals

How Mass-Based Trading Works

Emissions Budget

State's Mass-Based Goal →

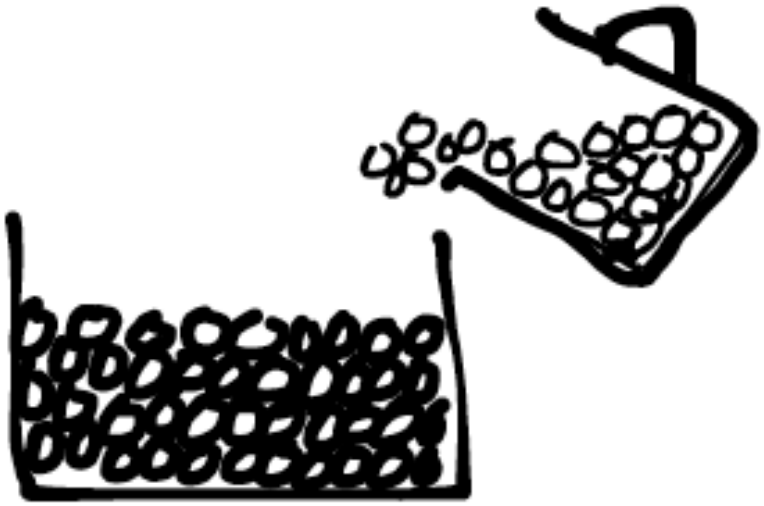
= allowed tons, or "allowances"

Emissions budget = total number of tons that can be emitted

State must distribute allowances

(under federal plan EPA makes this decision)

If a State Covers New Plants



Add

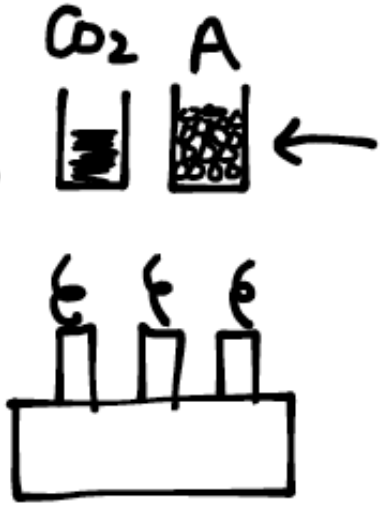
New Source "Complement" if covering new plants

allowances

(EPA won't cover new plants)

WHAT POWER PLANTS MUST DO

Every plant must measure, monitor + report its CO_2 emissions



Every plant must have sufficient allowances to cover its emissions at the end of each compliance period

(same whether EPA or State implements)

Rate = emissions/ production – lbs of CO_2/MWH

How Rate-Based Trading Works

ERCs = Emission Rate Credits – units are MWh – add to production to reduce rate

- Every plant measures, monitors + reports CO_2 emissions + generation (MWhrs)
- Every plant must meet prescribed emissions rate, either actually or after ERCs are added to generation.

Other ERCs

STATE PLANS

- Demand-side EE in a rate-based state generating savings in 2022 or later
- Savings from Transmission + Distribution upgrades post-2012 delivering savings in a rate-based state in 2022 or later.
- CHP/WHP
- Biomass/ Waste to Energy
- Any other measure that meets general requirements

These may or may not end up in federal plan

How to Decide Rate or Mass?

Total Cost?

ON DAY ONE

Allowances | ERCs

Will they be there when I need them?

Administrative Simplicity

Transaction costs?

Budget? Staffing?

What are the options to comply?

What can free up allowances?		What can Earn ERCs?
YES	Retirements?	NO
YES	Shift to Gas?	(LIMITED)
YES	New Renewables?	YES
YES	Energy Efficiency?	YES
YES	New Nuclear?	YES
YES	Decreases in Electricity Demand (other than EE)?	NO

But this is the big "rub" of mass plans – increases in electricity demand use allowances

Back to Energy Efficiency

Many CO_2 Reduction Opportunities

- Heat rate improvements
- Fuel switching to a lower carbon content fuel
- Integration of renewable energy into EGU operations
- Combined heat and power
- Qualified biomass co-firing and repowering
- ***Renewable energy (new & capacity uprates) - wind, solar, hydro***
- Nuclear generation (new & capacity uprates)
- ***Electricity transmission and distribution improvements***
- Carbon capture and utilization/sequestration for existing sources
- ***Demand-side energy efficiency measures, programs and policies –***

Energy efficiency improvements are expected to be an important part of state compliance across the country and under all state plan types, providing energy savings that reduce emissions, lower electric bills, and lead to positive investments and job creation

Demand-Side Energy Efficiency Strongly Supported in CPP

CPP encourages states to select energy efficiency as a compliance path

- Under a mass-based approach, energy efficiency automatically "counts" toward compliance and states can use an unlimited amount to help achieve their state goals
- Under a rate-based approach, CPP enables states to get credit for all eligible energy efficiency projects whose electricity savings are documented via EM&V
- The Clean Energy Incentive Program (CEIP) provides additional incentives for early investment in demand-side energy efficiency in low-income communities

Some Efficiency Changes from Proposed to Final

- Emissions reductions from projects installed today that are still achieving quantifiable and verifiable energy savings in 2022 may be applied toward adjusting a CO_2 emission rate during the compliance period.
- Unlike the proposed rule which called for state energy efficiency policies and programs to become federally enforceable if a state didn't meet its goal, the final Clean Power Plan created a state measures approach. Federal backstop, not federal enforcement of state measures.
- The CEIP provides an additional incentive for energy efficiency efforts in low-income communities.
- The final Clean Power Plan simplifies interstate accounting for energy efficiency compared to the proposal.

Eligible Efficiency

- Demand-side energy efficiency may include a range of eligible measures that are zero-emitting and avoid, rather than simply shift, the use of electricity
- Primary requirement is that the measures can be quantified and verified in accordance with the EM&V requirements in the CPP Emission Guidelines.
- This means that a very wide range of programs, projects and measures could be eligible.
- Examples of efficiency measures listed in the CPP Emission Guidelines include:
  - Measures that reduce electricity use in residential and commercial buildings, industrial facilities, and other grid-connected equipment
  - Water efficiency programs that improve efficiency at water and wastewater treatment facilities,
  - Projects implemented by energy service companies
  - Programs, such as appliance replacement and recycling programs and behavioral programs, administered by electric utilities, state entities, and other private and non-profit entities
  - State or local requirements that result in electricity savings, such as building energy codes and state appliance and equipment standards
- CHP projects are also listed as eligible for generation of ERCs

Early Investments – *slide excerpts from U.S. EPA*

- EPA is providing the Clean Energy Incentive Program (CEIP) to incentivize early investments that generate wind and solar power **or reduce end-use energy demand during 2020 and 2021**
- The CEIP is an optional, "matching fund" program states may choose to use to incentivize early investments in wind or solar power, as well as **demand-side energy efficiency measures that are implemented in low-income communities**
- EPA will provide matching allowances or Emission Rate Credits (ERCs) to states that participate in the CEIP, up to an amount equal to the equivalent of 300 million short tons of CO_2 emissions. The match is larger for low-income EE projects, targeted at removing historic barriers to deployment of these measures. Also, states with more challenging emissions reduction targets will have access to a proportionately larger share of the match
- In addition to the CEIP, states may also offer credit for early investments in RE and demand-side EE according to the provisions of section VIII.K.1 of this final rule: a state may **award ERCs** to qualified providers that **implement projects from 2013 onward** that realize quantified and verified MWh results in 2022 and subsequent years.

How EE/RE Fits in the Clean Power Plan

- slide from U.S. EPA

State Plan Approach		Role of EE/RE in State Plan	State Strategies for EE/RE	EM&V Needed?	Considerations
Emission Standards	Mass	*EE reduces cost, EE/RE lowers CO_2 emissions but are not enforceable or written into the state plan*	• Allocate CO_2 allowances for EE/RE (e.g. through a set aside)	*	* EM&V generally not required for CPP purposes, except for CEIP and set asides specifically created to meet the leakage requirement • Unlimited flexibility with EE/RE implementation
			• Auction allowances, use $ for EE/RE		
			• Secure matching allowances for solar, wind and low-income EE from Clean Energy Incentive Program (CEIP)	✓	
	Rate	*Explicitly written into state plan; Used to generate ERCs and directly adjust reported CO_2 emissions rate of affected EGUs*	• Include EE/RE ERC tracking, trading, and issuance provisions in the state plan	✓	• EM&V plans and M&V reports required • EE/RE is explicitly tracked & credited • Trading-ready plans facilitate broad access to ERCs • EE/RE implemented after 2012 can generate credits starting in 2022
			• Issue ERCs for quantified and verified MWh savings from eligible EE/RE measures	✓	
			• Secure matching ERCs from CEIP for solar, wind, low-income EE	✓	
State Measures	State Demonstration Based on Mass	*Explicitly included as supporting material for state plan – enforceable under state law; State EE/RE policies and measures can be used to help affected EGUs meet mass goal*	• Implement state EE/RE policies and programs (e.g., EERS, RPS, building codes) that are enforceable under state law, either to meet goal or in conjunction with federally enforceable limits	✓*	• Projection of EE/RE impacts required and EGU CO_2 performance required ✓* EM&V Plan for EE/RE measures must be included as supporting material for state plan • Backstop emission standards for affected EGUs if CO_2 reductions don't materialize
			• Secure matching allowances from CEIP for solar, wind and low-income EE	✓	

CPP EE EM&V In One Slide

Do I need to do EM&V?

- Mass –
  - EGU Emission Standards Plan – Not really
  - State Measures Plan – Yes, but not fundamental to compliance calculations
- Rate –
  - EGU Emission Standards Plan - Yes, fundamental to compliance calculations
- CEIP –
  - Mass or rate plans - Yes

EM&V "musts"

- Prepare an EM&V plan that provides for quantified and verified savings by applying industry best-practice protocols and guidelines
- Provide regular interval EM&V and periodic reports
- Use a baseline that represents what would have happened in the absence of the demand-side EE activity – common practice baseline
- Address savings persistence
- Have independent verification
- No double counting

For the CPP, EM&V is primarily associated with successfully quantifying and verifying savings for generating emission rate credits (ERCs) and adjusting an emission rate

Efficiency EM&V Coverage in the CPP

CPP Document	Type of EM&V Information	Notes
CPP Emissions Guidelines – see Section VIII.K	Requirements	Must do for CPP compliance to quantify and verify savings
Proposed Model Trading rule - see Section IV.D.8.	Presumptively approvable EM&V approaches	Strongly recommended characteristics of EM&V for approvable State Plans. Any alternative EM&V approaches implemented by a state must be "equivalent" to the presumptively approvable provisions
EM&V Guidance for Demand Side EE	Applicable guidance	Further information and recommendations covered in this companion document

Energy Efficiency in the CPP – Rate-Based Approach

- **EE can be used to generate Emission Rate Credits (ERCs) that are used to help meet the rate target**
- **Rate based approaches are where there are significant CPP EM&V and tracking requirements for EE**

CPP Emissions Rate =

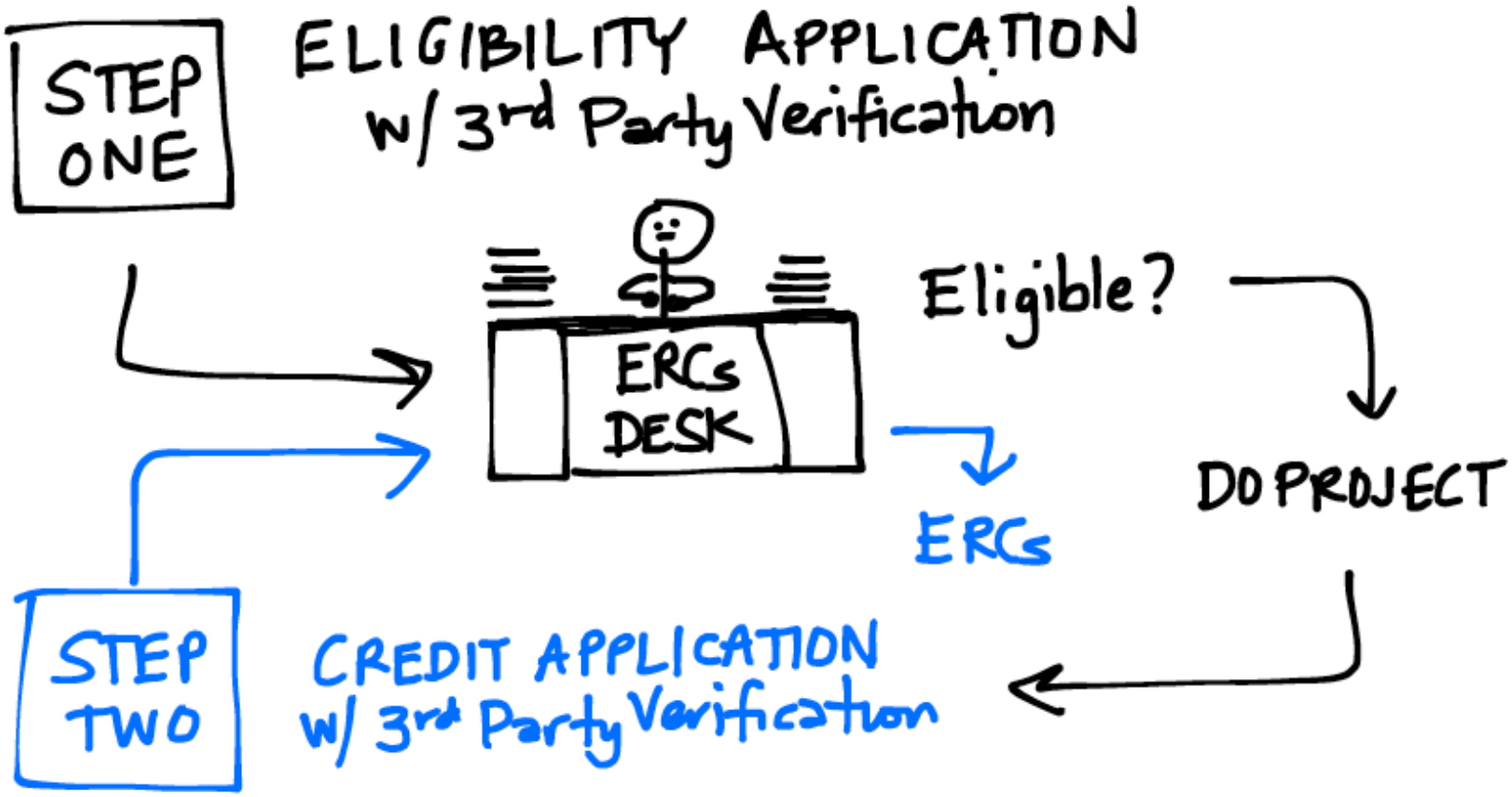
$$\frac{\text{(Affected EGU Emissions, lbs/year)}}{\text{(Affected EGU Generation, MWh/year)} + \text{(ERCs, MWh/year)}}$$

Example:

- Emission = 1,000,000 lbs/year
- Generation = 1,000 MWh/year
- Emission rate = 1,000 lbs/MWh
- Target = 800 lbs/MWh
- ERCs required = 250 MWh/yr ➡ CPP Rate = 800 lbs/MWh

Metric is Annual MWh

The ERC Process – slide from Franz Litz, Program Consultant, Great Plains Institute



! Liability for improperly issued ERCs lies with the affected EGU who uses them for compliance !

Energy Efficiency in the CPP – Rate Based Approach (continued)

- *Reminders:*
  - *Only emission standard plans use rate-based approaches (not state measure plans)*
  - *In proposed federal plan there are no end-use efficiency ERCs*

Some detail from CPP:

"..a state may implement a **market-based emission trading program**, which enables EGUs to generate and procure [Emission Rate Credits] **ERCs**, a tradable compliance unit representing **one MWh of electric generation (or reduced electricity use)** with zero associated CO_2 emissions."

"…These ERCs may then be used to adjust the reported CO_2 emission rate of an affected EGU when demonstrating compliance with a rate-based emission standard. **For each submitted ERC, one MWh is added to the denominator of the reported CO_2 emission rate, resulting in a lower adjusted CO2 emission rate.**"

Energy Efficiency in the CPP – Mass-Based Approach

- *Reminders:*
  - *State measure plans are mass plans*
  - *Emission standard plans can be rate or mass plan*

- **EE reduces emissions mass "indirectly":**
  - **Complimentary programs – e.g., energy codes, EERS, public buildings programs**
  - **Could be funded with allowance auction funds**

- **Emission Standards plan – EE does not have to be defined and thus EM&V does not have to be defined in plans (probably)**

- **State measures plan – EE measures do need to be defined and thus EM&V Plan is required**

Energy Efficiency in the CPP – Mass-Based Approach

EE EM&V is less of an issue with mass-based approach, because it is not fundamental to compliance calculations but:

- **EE is implemented with complementary programs, which should have their own EM&V plans**
- **California's and RGGI's approaches to a mass cap can be examples**

From Emissions Guidelines

Emissions Standards Plans:

- ….incentivizes …. the use of strategies such as RE and demand-side EE as complementary measures that reduce CO_2 emissions.
- …. unlike under a rate-based approach, …. there is no need to address and describe these state measures in a state plan submission or quantify and verify …EE MWh of … savings…
- ….. recognizes a wide range of … actions while being relatively simple …. implement and administer.

State Measures Plans

- Measures implemented ….could include demand-side EE requirements and deployment programs.
- This plan type would allow the state to implement a suite of state measures that are adopted, implemented, and enforceable only under state law, …. [not federally enforceable]

EM&V for CEIP

- In the final Emissions Guidelines, the agency laid out the high-level parameters of the CEIP including a requirement for EM&V
- However, EPA also stated that it would seek input before fully developing the specific details related to the design and implementation, including EM&V, of the CEIP program
- One possibility would be for EPA to indicate for the CEIP the same EM&V requirements and guidance provided for efficiency ERCs

EM&V Requirements

Emissions Guidelines (EG) requirements are general and relatively limited, including (see EG for complete description):

- State plan would include EM&V plan for quantifying and verifying electricity savings on a retrospective (ex-post) basis using industry best-practice EM&V protocols and methods that yield accurate and reliable measurements of electricity savings.
- Assessment of the independent factors that influence the electricity savings and the expected life of the savings
- Baseline that represents what would have happened in the absence of the demand-side EE activity
- Periodic M&V reports
- Independent verification
- Skill certification is also discussed

Avoiding Double Counting

Double counting must be avoided – potential sources:

1. Same savings (project) counted twice
2. Program (baseline) overlaps
3. Trading between states (possible unintended consequences)

From Model Trading Plan:

- EM&V should address "How double counting will be avoided through the use of tracking and accounting procedures to ensure that the same MWh of electricity savings is not claimed more than one time (for example, two EGUs claiming savings from the same lighting retrofit).
- The types of double counting that may arise are discussed in the EPA's draft EM&V guidance."

Examples from EM&V Guidance:

- Two EGUs or an EGU and an ESCO claiming savings from same project
- Savings from same retrofit being claimed by residential behavior-based program and retailer point-of-sale incentive program
- Claiming savings from enacting a building code and specific project savings with below code savings

EM&V Guidance and Model Trading Rule

Cover wide range of EM&V topics, including the following list from CPP EM&V Guidance document:

- EM&V Methods
- Electricity savings metrics and baselines
- Reporting timeframes and considerations
- Deemed savings
- Independent factors
- Accuracy and reliability
- Avoiding double counting
- Persistence of savings
- Savings quantification/verification cycles
- T&D savings adders
- Interactive effects
- EE EM&V Protocols and Guidelines

Also Covered in Guidance and/or Model Rule:

- Tracking and compliance systems
- Independent verification and review
- Additional EM&V guidance for several common EE program and project types
  - Programs implemented using utility customer funds ("utility EE programs")
  - Individual or aggregated EE projects, such as those implemented by ESCOs or at industrial facilities
  - Building energy codes
  - Appliance energy standards
- Glossary of key terms
- Templates for program and project EM&V plans.
- Examples for several common measure types

Trading– quick notes

- Trading is allowed, encouraged in the Rule –
  - Emission rate credits (for a rate-based standard) or
  - Allowances (for a mass-based standard)
- Trading of ERCs, including EE ERCs under Rate Based Approach, can support CPP compliance:
  - Intra-state and Inter-state
  - Final Plan does not require complex air quality modeling to identify location of emission impacts from efficiency nor adjustment or discounting of efficiency impacts that cross state lines
- In terms of mass plans:
  - There is not a currently defined mechanism for trading efficiency-based allowances in the CPP documents
  - One case in which efficiency could receive allowances under a mass-based plan approach is through a *set aside* for efficiency program and projects

Tracking – quick notes

From Emission Guidelines:

Tracking system must:

- Record the issuance, transfer and surrender of ERCs for compliance or retirement
- Provide electronic public access
- Provide for transfers of ERCs to/from another ERC tracking system

From Model Trading Plan:

EM&V plans must describe how:

"…double counting will be avoided through the use of tracking and accounting procedures to ensure that the same MWh of electricity savings is not claimed more than one time (for example, two EGUs claiming savings from the same lighting retrofit). The types of double counting that may arise are discussed in the EPA's draft EM&V guidance."

From EM&V Guidance:

Implement "systematic tracking and accounting procedures, including the use of well-structured and well-maintained tracking and reporting systems such as those already being used by many states and EE providers."

Can You Use Your Current EM&V Practices?

Selected Topics	What CPP Says
EM&V approaches	From EG: All electricity savings must be quantified and verified based on methods and procedures detailed in an industry best-practice EM&V protocol or guideline. "States may not allow MWh values that are quantified using ex-ante (pre-implementation) estimates of savings." *Model Plans –presumptively approvable – ""all* electricity savings must be quantified by applying one or more of the following methods: PB-MV, comparison group approaches, or deemed savings."
Baselines	From EG: "*Common practice baseline or CPB* means a baseline derived based on a default technology or condition that would have been in place at the time of implementation of an EE measure in the absence of the EE measure (for example, the standard or market-average or pre-existing equipment that a typical consumer/building owner would have continued to use or would have installed at the time of project implementation in a given circumstance, such as a given building type, EE program type or delivery mechanism, and geographic region). *Model Plans – CPB is presumptively approvable*
Independent verification	From EG: "… results are verified by an accredited independent verifier, and its verification assessment must be included as part of the M&V report submitted to the state regulatory body." Further guidance provided in Model Trading Rule
Persistence of savings	From Model Trading Rule: "All EE programs, EE projects, or EE measures must be quantified at time intervals (in years) sufficient to ensure that MWh savings are accurately and reliably quantified." • C&S: every four years • Utility and public funded programs: every 1, 2 or 3 years • Commercial and industrial projects: every year (unless can justify…)

Places Where There is Text on EM&V:

- **Emission Guidelines:**
  - *3. EM&V requirements for RE, demand-side EE, and other measures used to adjust a CO2 rate* - Pages 1282 – 1291
  - *Evaluation Measurement and Verification Plans and Monitoring and Verification Reports* - Pages 1503- 1506
- **Model Trading Plans**
  - *8. Evaluation, Measurement, and Verification (EM&V) Plans, Monitoring and Verification (M&V) Reports, and Verification Reports* - Page 183-218 (Demand Side EE staring on 202) **Requests for comments starting on page 211**
  - *§ 62.16260 What are the requirements for evaluation measurement and verification plans for eligible resources?* - Page 506-523 (Demand Side EE staring on 514)
  - *§ 62.16265 What are the requirements for monitoring and verification reports for eligible resources? § 62.16270 What are the requirements for verification reports?* Pages 523-529
  - *§ 62.16275 What is the accreditation procedure for independent verifiers? §62.16280 What are the procedures accredited independent verifiers must follow to avoid conflict of interest? § 62.16285 What is the process for the revocation of accreditation status for an independent verifier?* - Pages 529-537
- EM&V Guidance
  - Includes request for comments list on Page v

CPP Resources

- Clean Power Plan website:
  http://www2.epa.gov/carbon-pollution-standards

- Specific Documents:
  - CPP Emission Guidelines: http://www.epa.gov/airquality/cpp/cpp-final-rule.pdf
  - Federal Model Plan: http://www.epa.gov/airquality/cpp/cpp-proposed-federal-plan.pdf
  - EM&V Guideline:
    http://www2.epa.gov/cleanpowerplantoolbox/draft-evaluation-measurement-and-verification-guidance-demand-side-energy

- For additional resources to help states develop plans, visit the CPP Toolbox for States: http://www2.epa.gov/cleanpowerplantoolbox

- EPA Overview and energy efficiency presentations:
  http://www2.epa.gov/cleanpowerplan/clean-power-plan-overview-webinar
  http://www2.epa.gov/cleanpowerplan/fact-sheet-energy-efficiency-clean-power-plan

Thank you


So apparently, changing to energy-efficient lightbulbs WASN'T enough.
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